

What is claimed is:

1. A braking system for a vehicle having at least one wheel comprising:

at least one battery capable of receiving and supplying power;

5 a plurality of eddy current devices that provide a retarding torque to the wheel of the vehicle when energized;

a brake pedal sensor;

a brake pedal having the brake pedal sensor attached thereto;

10 a generator driven by motion of said vehicle and capable of supplying power to the eddy current devices and the battery when the brake pedal sensor senses that the vehicle operator has placed the brake pedal in a predetermined pedal position;

a battery switch for selectably coupling said battery to said eddy current devices and said generator; and

15 a controller having memory storage capability, the controller for storing an actual power output of the generator, an elapsed energization time, a predetermined ramp time, and a predetermined power requirement of the eddy current devices, in memory, and receiving inputs from the brake pedal sensor and the generator, and based on memory and in response to inputs from the brake pedal sensor, the eddy current devices, and the generator, the controller generates signals for the battery switch

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2. A braking system according to claim 1, wherein the eddy current devices are electromagnetic retarders.

25 3. A braking system according to claim 1, wherein the plurality of eddy current devices equals 4.

4. A braking system according to claim 1, wherein the generator has an operating voltage of about 42 volts.

30 5. A braking system according to claim 1, wherein the battery has a voltage of 36 volts.

6. A braking system according to claim 1, wherein the predetermined pedal position of the brake pedal is a depressed position.

7. A braking system control method for a vehicle having a generator with a  
5 excitation and output winding therein, a plurality of eddy current devices, and a battery switch for selectably adding battery power into a power module for the eddy current devices, the method comprising the steps of:

detecting actuation of a braking switch;

coupling the eddy current devices to the battery for a predetermined ramp time;

10 opening the battery switch after the predetermined ramp time; and

energizing the eddy current devices by supplying power to the eddy current devices from the generator.

8. A braking system control method for a vehicle having a generator with a  
15 excitation winding and output winding therein, a plurality of eddy current devices coupled to the generator, a battery, a power rail receiving a rectified output of the generator, a battery switch for selectably coupling the battery to the power rail, a controller capable of storing and monitoring the voltage of the generator and the battery and generating control signals for the battery switch, and a friction braking system having a brake pedal, the method comprising the  
20 steps of:

energizing the generator by applying an electric current to the generator excitation winding such that current is generated in the output windings when the brake pedal is activated;

coupling the battery to the eddy current devices during an initial power interval  
25 after energizing the generator;

decoupling the battery from the eddy current devices at the end of the initial power interval;

comparing the generator voltage to the battery voltage during a second power interval after the initial power interval;

30 if the generator voltage is less than the battery voltage, then activating friction braking and decoupling the battery for as long as the brake pedal is pressed; and

coupling the battery to the power rail during the second power interval if the generator voltage is greater than the battery voltage.

9. A method according to claim 8, wherein the battery switch is a field effect transistor.

10. A method according to claim 8, wherein the initial power interval comprises a predetermined ramp time.

11. A method according to claim 10, wherein the predetermined ramp time is less than 200 milliseconds.

12. A method according to claim 8, wherein the second power interval occurs after the predetermined ramp time.

13. A braking system control method for a vehicle having at least one wheel, a generator having an excitation winding and an output winding therein, a plurality of eddy current devices capable of providing a braking force and generating a braking feedback signal, and a battery, the method comprising the steps:

energizing the generator by applying an electric current to the generator excitation winding such that current is generated in the output windings when the vehicle is braking;

coupling the battery to the eddy current devices during an initial power interval after energizing the generator;

calculating an actual power output of the generator based on a voltage applied to the generator, the wheel speed, a brake pedal signal based on the position of a brake pedal, and the braking feedback signal;

generating a fault signal for a vehicle operator and coupling the battery to the eddy current devices when the actual power output is less than a predetermined power requirement during a second power interval after the initial power interval; and

decoupling the battery from the eddy current devices when the actual power output is greater than the predetermined power requirement during the second power interval.

14. A method according to claim 13, wherein the initial power interval comprises a predetermined ramp time.

15. A method according to claim 14, wherein the predetermined ramp time is less  
5 than 200 milliseconds.

16. A method according to claim 13, wherein the second power interval occurs after the predetermined ramp time.

10 17. A braking system control method according to claim 13, wherein the battery switch is a field effect transistor.